

NOTES ON ANGLESITE, ANTHOPHYLLITE, CALCITE,  
DATOLITE, SILLIMANITE, STILPNOMELANE, TETRA-  
HEDRITE AND TRIPLITE.

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ANGLESITE CRYSTALS FROM GUNNISON COUNTY, COLORADO.

A specimen in the United States National Museum (Cat. No. 83,588), which was received from the United States Geological Survey in 1895, contains numerous small crystals of anglesite. This specimen was collected by S. F. Emmons in the Daisy Mine, Redwell Basin, Gunnison County, Colorado.

The specimen consists of a mass of ocherous and cellular limonite, upon and in the cavities of which the anglesite crystals are scattered. These crystals, which reach an extreme diameter of about 7 millimeters, are all identical

in combination but differ slightly in form, the larger individuals being tabular parallel to  $d(102)$ , while the smaller and more perfect crystals are prismatic by elongation par-

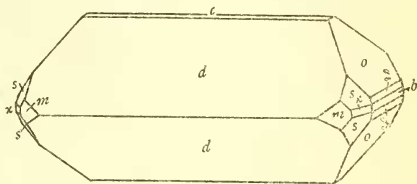


FIG. 1.—CRYSTAL OF ANGLESITE.

allel to the  $\bar{b}$  axis, the appearance being as illustrated in figure 1. The forms identified on these crystals are as follows: Pinacoids,  $c(001)$ ,  $b(010)$ . Prisms,  $m(110)$ ,  $x(130)$ . Domes,  $o(011)$ ,  $d(021)$ ,  $d(102)$ . Pyramid,  $s(132)$ .

The faces of the prism  $x(130)$  and the pyramid  $s(132)$  are completely rounded and etched. The remaining faces are brilliant and yield excellent reflections of the signal, although the dome  $d(102)$  is commonly striated parallel to the elongation.

ANGLESITE CRYSTALS FROM THE TINTIC DISTRICT, UTAH.

The anglesites from the Tintic district are now rather widely distributed and are consequently well known. They have been described by Farrington,<sup>1</sup> Rogers,<sup>2</sup> and Hülyak.<sup>3</sup> The extreme variability of anglesite in form and habit makes it profitable to examine the

<sup>1</sup> Farrington and Tillotson, Field Col. Mus. Pub. 3, vol. 7, p. 131, 1908.

<sup>2</sup> Rogers, A. F., School of Mines Quart., vol. 23, p. 135, 1902.

<sup>3</sup> Hülyak, Zeitsch. Kryst., vol. 36, p. 201.

crystals on each specimen of this material; often two distinctly different types of crystals occur on opposite sides of the same specimen. The United States National Museum collections contain three large exhibition specimens of this Utah material which have not, heretofore, been examined crystallographically. A study of these crystals shows them all to be somewhat different in development from the Utah anglesites already described. A single form new to the species was observed, together with two additional forms not previously found on the anglesite from this locality.

The anglesite from the Tintic district or from Eureka, as it is generally labeled, occurs as brilliant adamantine crystals like those of Monte Poni implanted in cavities in solid masses of granular galena. They are usually highly lustrous and perfectly transparent and limpid. The smoky tint so common in the Sardinian specimens is rarely encountered, and the dull, pitted, and opaque appearance so characteristic of the Pennsylvania crystals is entirely absent in the Utah, as in the Idaho anglesites.

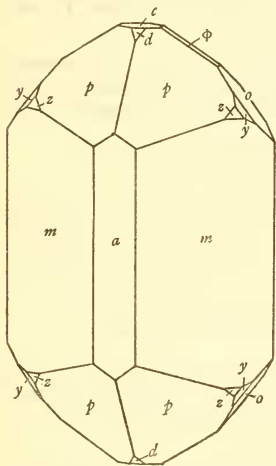


FIG. 2.—CRYSTAL OF ANGLESITE.

The specimens of galena on which these crystals occur are too large to be displayed in the systematic mineral collection, and are now in the exhibition series of lead-silver ores.

The first of these (Cat. No. 63717) is from the Eureka Hill mine, Tintic district, and was purchased from George L. English & Company in 1895. It consists of a large mass, weighing approximately 5 kilograms, of granular galena, containing parallel streaks and inclusions of gray limestone. About one-third of the broad surface of this mass is occupied by a flat cavity completely lined with brilliant transparent colorless crystals of anglesite, which reach a length of 1 centimeter. Scattered among the anglesite crystals and at times included in them are small globules of greenish translucent native sulphur. The crystals on this specimen are all of the same habit. They are prismatic parallel to the vertical axis, the dominant forms being the unit prism  $m(110)$  and the pyramid  $p(324)$ . The forms observed on this type of crystal are  $a(100)$ ,  $m(110)$ ,  $c(001)$ ,  $d(102)$ ,  $o(011)$ ,  $\phi(012)$ ,  $z(111)$ ,  $y(122)$ , and  $p(324)$ . The faces are clear and yield sharp signals. The prism zone is commonly striated parallel to the  $c$  axis by oscillation between the front pinacoid  $a(100)$  and the prism  $m(110)$ . The forms and appearance of these crystals are shown in figure 2.

A second specimen, a more recent accession (No. 93235), was donated by I. Pett, of Salt Lake City, through V. C. Heikes. The locality is given as the Eagle and Bluebell mine, Tintic district, Juab County, Utah. This specimen consists of a 5-kilogram mass of granular galena containing inclusions of limestone and containing small round cavities, in which the anglesite crystals are deposited. The crystals range from those 2 centimeters in diameter down to some a millimeter in diameter. The largest crystals are slightly smoky, but the smaller ones are very clear and brilliant. No native sulphur or other secondary product is associated with this anglesite. The commonest habit of these crystals is as shown in figure 3, short prismatic, parallel to the vertical axis.

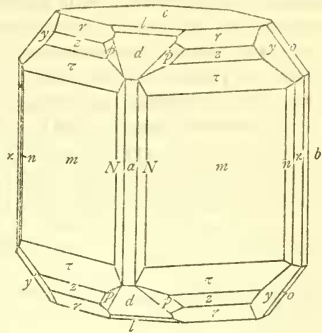


FIG. 3.—CRYSTAL OF ANGLESITE.

The number of forms present varies directly with the size of the crystals, the larger individuals exhibiting the rare or unusual forms. On crystals of this type the forms found are  $a(100)$ ,  $b(010)$ ,  $c(001)$ ,  $d(102)$ ,  $l(104)$ ,  $o(011)$ ,  $m(110)$ ,  $n(120)$ ,  $N(310)$ ,  $x(130)$ ,  $r(112)$ ,  $z(111)$ ,  $\tau(221)$ ,  $p(324)$ , and  $y(122)$ . The prism zone is vertically striated.

In a smaller cavity on one side of this specimen there were small groups of crystals in parallel position, which, while having the same general appearance, were elongated parallel to the  $a$  axis. The appearance of these crystals is shown in figure 4, the forms present being  $a(100)$ ,  $c(001)$ ,  $m(110)$ ,  $x(130)$ ,  $o(011)$ ,  $O_1(023)^*$ ,  $z(111)$ ,  $p(324)$ , and  $r(112)$ .

The third and largest specimen of Utah anglesite in the National collections (Cat. 93263) is also from the Eagle and Bluebell

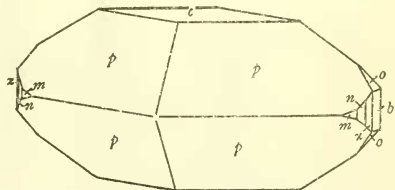


FIG. 5.—CRYSTAL OF ANGLESITE.

mine, and was received from W. H. Parker through V. C. Heikes. This is a mass of galena about 10 kilograms in weight, the upper surface of which is covered with a drusy layer of quartz with small

blades of barite. Upon this surface are scattered crystals of anglesite which reach an extreme diameter of 1 centimeter. Two prominent habits are represented—one tabular to pyramidal with  $p(324)$  predominating, the second short prismatic parallel to the  $a$  axis. These two types occur at opposite ends of the specimen and are not inter-mixed. A typical crystal of the pyramidal type is shown in figure 5, the forms present being  $p(324)$ ,  $c(001)$ ,  $b(010)$ ,  $o(011)$ ,  $m(110)$ ,  $n(120)$ , and  $x(130)$ . A more tabular individual shown in figure 6 has the additional

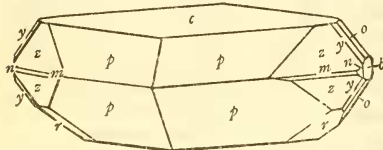


FIG. 6.—CRYSTAL OF ANGLESITE.

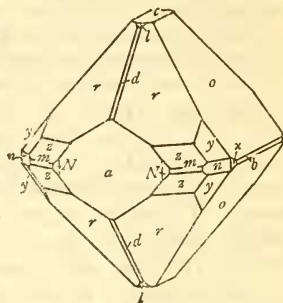


FIG. 7.—CRYSTAL OF ANGLESITE.

forms  $y(122)$ ,  $z(111)$ , and  $r(112)$ . The short prismatic type found on these specimens is illustrated in figure 7, the forms being  $a(100)$ ,  $b(010)$ ,  $c(001)$ ,  $l(104)$ ,  $d(102)$ ,  $o(011)$ ,  $N(310)$ ,  $m(110)$ ,  $n(120)$ ,  $x(130)$ ,  $y(122)$ , and  $z(111)$ .

A complete list of forms thus far reported from this locality is given in the table below:

*Forms on Utah anglesite.*

Form.	Symbol.	Authority.
$a$	(100)	Farrington, etc.
$b$	(010)	Do.
$c$	(001)	Do.
$m$	(110)	Do.
$M$	(410)	Do.
$\delta$	(230)	Do.
$n$	(120)	Do.
$o$	(011)	Do.
$d$	(102)	Do.
$l$	(104)	Do.
$r$	(112)	Do.
$z$	(111)	Do.
$\tau$	(221)	Do.
$p$	(324)	Do.
$y$	(122)	Do.
$\mu$	(124)	Do.
$h$	(340)	Hulvák.
$\kappa$	(130)	Do.
$C$	<sup>1</sup> (10-7-0)	Do.
$D$	<sup>1</sup> (1-0-16)	Do.
$Y$	<sup>1</sup> (209)	Do.
$v$	<sup>1</sup> (9-12-1)	Do.
$v$	<sup>1</sup> (25-25-17)	Do.
$v$	<sup>1</sup> (14-14-9)	Do.
$v$ :	<sup>1</sup> (15-15-11)	Do.
$\phi$	(012)	Shannon.
$O_1$	<sup>1</sup> (023)	Do.
$N$	(310)	Do.

<sup>1</sup> New from this locality.

In the present studies Hulyak's new forms were not observed nor were  $M(410)$  or  $\delta(021)$  seen. Of the forms found, two  $\varphi(012)$  and  $N(310)$ , are new to the locality.  $O^1(023)$  is a previously undescribed dome which has the following angles:

		Measured.	Calculated.
$c(001)$	$\wedge$	$O_1(023) = 41^\circ 32'$	$40^\circ 41'$

Since it was observed only on one crystal and the observed and the calculated angles do not compare very favorably this must be regarded as a doubtful form.

ANGLESITE CRYSTALS FROM THE HERCULES MINE, COEUR D'ALENE DISTRICT, IDAHO.

The Hercules mine at Burke, in the Coeur d'Alene District, produced from its upper levels many hundreds of tons of cerussite ore, in much of which the cerussite was in fine crystals. Many beautiful specimens of pyromophite and native silver and some plattnerite have also been obtained from this mine, but thus far anglesite has not been recorded from this or any other mine in the Canyon Creek section. The writer was much interested, therefore, to find in the United States National Museum collections a specimen (Cat No. 77069-87) showing well-crystallized anglesite.

The specimen which was labeled "ore, native silver," is a mixture of earthy limonite with massive anglesite, looking precisely like the majority of specimens of carbonate lead ore. Implanted upon this earthy mass are numerous well-defined transparent anglesite crystals. Over the anglesite crystals are strung dendritic crystalline wires of native silver, now entirely blackened exteriorly by a tarnish of silver sulphide.

The anglesite crystals are tabular in development, the shape being determined by the forms  $c(001)$ ,  $m(110)$ , and  $d(102)$ . They reach

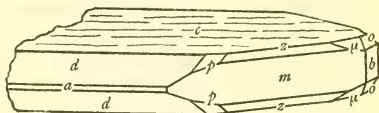


FIG. 8.—CRYSTAL OF ANGLESITE.

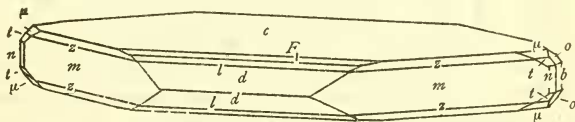


FIG. 9.—CRYSTAL OF ANGLESITE.

an extreme length of 2 cm., although the average is about 3 millimeters, with a thickness of 1 millimeter. They fall in two types depending on the accessory forms present. Type 1 as shown in figure eight has as the dominant forms  $c(001)$ ,  $m(110)$ , and  $d(102)$ . As accessory forms there are represented  $a(100)$ ,  $b(010)$ ,  $z(111)$ ,  $o(011)$ ,  $\mu(124)$ , and  $p(324)$ . Type 2 (fig. 9) has the same gen-

eral aspect determined by  $c(001)$ ,  $m(110)$ , and  $d(102)$ . In this type,  $p(324)$  and  $a(100)$  are absent, and in their stead there were found the prism  $n(120)$ , pyramid  $t(121)$ , and domes  $l(104)$  and  $F_1(1-0-14)$ .

The total of 13 forms found may be listed as follows:

Pinacoids:  $a(100)$ ,  $b(010)$ ,  $c(001)$ .

Macrodomes:  $d(102)$ ,  $l(104)$ ,  $F_1^*(1-0-14)$ .

Brachydome:  $o(011)$ .

Prisms:  $m(110)$ ,  $n(120)$ .

Pyramids:  $z(111)$ ,  $\mu(124)$ ,  $p(324)$ ,  $t(121)$ .

The new dome  $F_1(1-0-14)$  was observed only once as a very narrow line face yielding a rather poor signal. The observed and calculated angles are as follows:

	Measured	Calculated.
$c(001) \wedge F_1(1-0-14) = 6^\circ 55'$		$6^\circ 41'$

#### CALCITE CRYSTALS FROM THE OVERLOOK MINE, PIONEERVILLE DISTRICT, IDAHO.

A specimen of ore from the Overlook Mine, Pioneerville district, Boise County, Idaho, contains well-developed crystals of calcite. Calcite is commonly present in the gold ores of many southern Idaho mines, but where the mineral forms well-developed crystals these almost invariably take the form of very flat rhombohedrons. The present crystals are so different from this prevailing type that they merit a short note, although displaying no new forms. This is especially true, since the writer has long held the view that the crystallographic development assumed by the omnipresent mineral calcite is an important criterion in ore-bearing veins, capable of indicating the temperature and to some extent the composition of the solutions from which it crystallized.

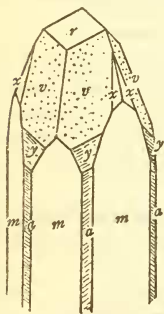


FIG. 10.—CRYSTAL OF CALCITE.

The specimen in question consists of a breccia of greatly bleached and altered angular fragments of what appears to have been originally an acidic lava or other fine-grained igneous rock, cemented by masses of coarse cleavable galena and pyrite in a gangue of calcite and quartz. The calcite crystals which line a small cavity are prismatic in development and reach a length of 1 centimeter. They are transparent and colorless. The aspect is like figure 10, the forms present being identified as  $m(10\bar{1}0)$ ,  $a(1\bar{1}20)$ ,  $v(2\bar{1}\bar{3}1)$ ,  $r(10\bar{1}1)$ ,  $y(32\bar{5}1)$ , and  $x(1\bar{3}\bar{4}1)$ .<sup>1</sup>

<sup>1</sup> When the drawing was made the form marked  $x(1\bar{3}\bar{4}1)$  was thought to be another scalenohedron having the indices  $(3-9-\bar{1}2-4)$ . Some small discrepancy has thus resulted, the difference being insufficient to make it advisable to redraw the figure.

The specimen is from an unstudied collection of ores, made by Edward L. Jones, Jr., formerly of the United States Geological Survey. The writer is indebted to Dr. F. L. Ransome for freely consenting to the present use of the material.

CRYSTALLIZED TETRAHEDRITE FROM THE HYPOTHEEK MINE, PINE CREEK DISTRICT, IDAHO.

Tetrahedrite occurs commonly in the Hypotheek mine in the Pine Creek district of Idaho in a portion of the vein which is barren of galena, and contains, in addition to the tetrahedrite, chalcopyrite, pyrite, and arsenopyrite in a gangue of quartz, calcite, and siderite.<sup>1</sup> Tetrahedrite is very rare in this district, although it occurs commonly in veins of a different type in the adjoining Coeur d'Alene district. In this general region the tetrahedrite is usually massive and more or less highly argentiferous. The specimens from the

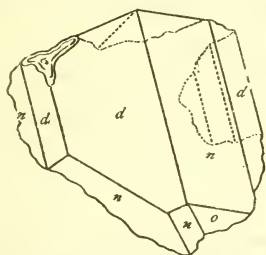


FIG. 11.—CRYSTAL OF TETRAHEDRITE.

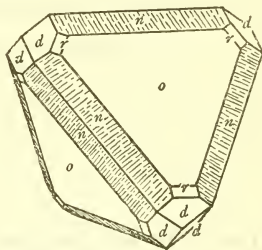


FIG. 12.—CRYSTAL OF TETRAHEDRITE.

Hypotheek mine examined by the writer are those collected by Jones, and they are labeled as coming from the old workings east of the fault on the 700-foot level.

The specimens consist of coarse vitreous white vein quartz containing the greasy appearing gray tetrahedrite filling narrow veins. Small open cracks in the quartz are lined with minute quartz crystals and well-bounded crystals of tetrahedrite which reach five millimeters in diameter. Most of these show bright faces, which yield excellent reflections of the signal. The development is such, however, that the tetrahedral symmetry is not apparent. A typically developed crystal is shown in figure 11. The most completely developed and symmetrical crystal measured is shown in somewhat idealized form as figure 12. The forms recognized are  $o(111)$ ,  $n(211)$ ,  $d(110)$ , and  $r(332)$ .

<sup>1</sup> Jones, E. L. Jr. A Reconnaissance of the Pine Creek District, Idaho, Bull. U. S. Geol. Surv. No. 710-A. p. 27.

It is possible by careful picking under a lens to free the mineral for analysis from all visible impurities except quartz. A portion of 1 gram gave the following results:

*Analysis of tetrahedrite, Hypotheek Mine.*

	Per cent.
Quartz.....	13.57
Sb.....	23.03
Fe.....	4.41
Cu.....	32.38
Zn.....	3.33
Ag.....	Trace
As.....	Trace
Pb.....	None
Bi.....	Trace
S.....	22.74
Total.....	99.46

With impurities deducted the figures recalculated to 100 per cent, yield:

*Recalculated analysis of tetrahedrite.*

Sb.....	26.81
Fe.....	5.13
Cu.....	37.70
Zn.....	3.87
S.....	26.49
	100.00

In view of its mode and place of occurrence the mineral is unique in the absence of appreciable amounts of silver and arsenic, especially the latter, since arsenic is common as arsenopyrite in the same vein. Owing to the small amount of material available it was impossible to prove the absence of zonal structure in the crystals. The analysis consequently gives no basis for speculation as to the constitution of the mineral.

TRIPLITE FROM CHATHAM, CONNECTICUT.

Some specimens of a brownish-red massive mineral supposed to be triplite were shown the writer by Prof. William North Rice, and with the aid of directions furnished by Professor Rice the locality from which these specimens came was found and several specimens were collected. Laboratory study of this mineral confirms the original identification, the mineral being a normal triplite rather low in iron, though not so low as one recently described by Hess and Hunt.

The mineral occurs imbedded in platy aggregates of the clevelandite variety of albite in a mass of pegmatitic material largely consisting of quartz and lepidolite. These minerals came from a



small cut which is largely filled in with leaves and soil, and the relations of the lithia rich pegmatite are not shown. Surrounding exposures consist of a normal granite-pegmatite of ordinary composition quite free from unusual accessory minerals. At least two great dikes of normal pegmatite are exposed here. These are just north of the Chatham-Haddam town line and probably represent the continuation of the same pegmatite quarried at the famous Gillette Haddam Neck quarry, which is not far distant in the line of strike. The lithia-rich material forms a segregation, or, more probably, a slightly later complementary intrusion, in the main mass of the granite pegmatite. The material removed from the cut consists almost entirely of lepidolite and white quartz in nearly equal amounts. Feldspar of the ordinary kind is entirely absent. The lepidolite was mined for export for its lithia content, but most of that extracted is still lying around the pit. The platy cleveandite contains a few crystals of muscovite penetrated by crystals of opaque green tourmaline and bordered by lepidolite in parallel growth. The triplite occurs in irregular masses, which may reach 10 centimeters in diameter, ranging in color from flesh red to dark brownish red. The cleavage is not pronounced and the material resembles massive garnet. Intergrown intimately with the triplite are muscovite and fine-grained deep-blue tourmaline, the last surrounding the triplite in a crust and penetrating it along cracks and appearing as though derived from the phosphate by alteration. Much of the triplite is granular and friable from mechanical disintegration. Some black oxide of manganese occurs as an alteration product. The hardness of the mineral is around 3.5; specific gravity, 3.584. Upon analysis the results given in column I of the following table were obtained. In column II is given the composition of the triplite from Nevada.<sup>1</sup>

*Analyses of triplite from Connecticut and Nevada.*

	I.	II.
Insoluble.....	1.17	.....
MnO.....	52.40	57.63
CaO.....	3.18	2.86
MgO.....	.58	1.21
FeO.....	4.95	1.68
P <sub>2</sub> O <sub>5</sub> .....	32.81	31.84
H <sub>2</sub> O.....	.35	.....
F.....	9.09	7.77
	104.53	102.99
Less O=F.....	3.83	3.27
Total.....	100.70	99.72

<sup>1</sup> Hess and Hunt, Amer. Journ. Sci., vol. 36, p. 51, 1913.

The optical properties as determined by Dr. E. S. Larsen are as follows:

Indices of refraction:

$$\alpha=1.665, \pm.003.$$

$$\beta=1.673, \pm.003.$$

$$\gamma=1.682, \pm.003.$$

$$\alpha-\gamma=.017, \pm.003.$$

Optically positive (+), 2V, near 90°. Pleochroism distinct:  $\alpha$ =pale reddish brown;  $\beta$ =nearly colorless;  $\gamma$ =very pale reddish brown.

The indices of refraction are considerably higher than are those of the Nevada material, the indices of which were found to be as follows:  $\alpha=1.650$ ;  $\beta=1.660$ ;  $\gamma=1.672$ .

This suggests that a gradual increase in the indices of refraction accompanies the replacement of manganese by iron.

The mineral is readily soluble in hot nitric or hydrochloric acid.

#### DATOLITE CRYSTALS FROM MERIDEN, CONNECTICUT.

In a lot of minerals collected by the writer at Meriden, Connecticut, in October, 1919, were a number of specimens of datolite. While the

crystals show no new or rare forms the habit is slightly different from that of any previously figured American datolite, and since datolite from this locality has not previously been described, a short note on the occurrence is here presented.

The quarry at Meriden is in the Middle basalt sheet and is located about 1 mile northwest of Meriden station. The rock here is all more or less amygdaloidal, and the amygdules are filled with various secondary minerals, chiefly quartz, anhydrite, chalcedony, calcite, and diabantite. The secondary minerals also occur in narrow veins, some of which persist for 50 or 75 feet, with a width of 2 or more inches. The datolite specimens were collected from such a vein on the east side of the deepest part of the quarry. The datolite was present here as a coating of crystals directly deposited on the greatly altered trap, no other mineral being associated with it. In another part of the quarry a hollow amygdule in the trap, several inches in diameter, was lined with small opaque white datolite crystals.

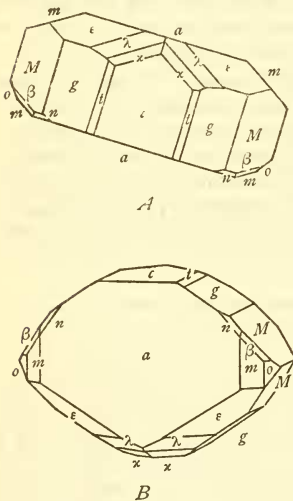


FIG. 13.—CRYSTAL OF DATOLITE. A, ORTHOGRAPHIC PROJECTION. B, CLINOGRAPHIC PROJECTION.

The crystals reach an extreme diameter of about 1 centimeter. They are colorless and rather lacking in brilliancy, so that they look like the calcite of the other parts of the quarry in color and luster and none of the specimens were identified as datolite until studied in the laboratory. The crystals on the five specimens collected are all remarkably alike in form. The habit is rather thick tabular parallel to the front pinacoid, the appearance being essentially as shown in orthographic and clinographic projection in the drawings figure 13 *a* and *b*. These crystals resemble those from Westfield, Massachusetts, except in this large development of the front pinacoid, but such tabular crystals have not been observed at Westfield.

The forms observed on the crystals are:

Pinacoids:	Pyramids:
<i>a</i> (100).	<i>n</i> (111).
<i>c</i> (001).	$\epsilon$ ( $\bar{1}12$ ).
Domes:	$\lambda$ ( $\bar{1}13$ ).
<i>t</i> (013).	$\kappa$ ( $\bar{1}15$ ).
<i>g</i> (012).	$\alpha$ ( $\bar{1}24$ ).
$m_x$ (011).	$\beta$ (121).
Prisms:	
<i>m</i> (110).	
<i>o</i> (120).	

*a*(100) is invariably the dominant form, being present as a broad and relatively smooth face, characteristically pearly in luster, as from reflection by parting or cleavage rifts parallel to this plane.

*c*(001) is prominent as a bright but somewhat irregular face, characteristically striated parallel to its intersection with the pyramid  $\kappa$  ( $\bar{1}15$ ).

*t*(013), *g*(012) and  $m_x$ (011) are prominent faces, especially the two latter, and yield clear brilliant signals;  $\kappa$  ( $\bar{1}15$ ),  $\lambda$  ( $\bar{1}13$ ), and  $\epsilon$  ( $\bar{1}12$ ) are present usually as bright small faces yielding good reflections.

*m*(110) is represented by small brilliant planes.

*n*(111) occurs only as a narrow but bright line beveling the edge *a*(100)  $\wedge$   $m_x$ (011).

$\beta$ (121) forms a narrow line beveling the angle *m*(110)  $\wedge$   $m_x$ (011).

*o*(120) forms a small triangular face, which with  $\beta$ (121) is always etched too deeply to reflect any light at all. These dull forms were identified by their zonal relations.

$\alpha$  ( $\bar{1}24$ ) occurs occasionally as a small brilliant plane beveling the edge  $\epsilon$  ( $\bar{1}12$ )  $\wedge$  *g*(012).

The angles observed are given in the following table:

*Angles on datolite from Meriden.*

	Observed.		Calculated.	
	°	'	°	'
$a \wedge m$ .....	33	16	32	23½
$m \wedge m$ .....	115	7	115	13
$c \wedge \kappa$ .....	24	58	25	19
$c \wedge \lambda$ .....	38	15	38	16
$c \wedge \epsilon$ .....	49	46	49	49
$c \wedge n$ .....	67	32	66	57
$c \wedge m$ .....	89	58	89	53
$c \wedge t$ .....	22	41	22	52½
$c \wedge g$ .....	32	59	32	20
$c \wedge m_x$ .....	51	50	51	41½
$m_x \wedge m_x$ .....	76	38	76	37

GEDRITE VARIETY OF ANTHOPHYLLITE FROM CHESTERFIELD,  
MASSACHUSETTS.

Under "Cummingtonite," in his work on the minerals of Old Hampshire County, Massachusetts, Prof. B. K. Emerson<sup>1</sup> gives the following:

The hair-brown hornblende, so long called anthophyllite, occurs in a highly pyritous rock associated with large garnets, and can be best obtained in the bluffs west of Bunnels Pond, in Chesterfield, and from large boulders down the hill nearly a mile southeast of Chesterfield church.

The writer in April, 1919, visited what was presumed to be the above locality, west of the pond in Chesterfield, marked Burnell's Pond on the Holyoke topographic sheet, but now locally known as Damon's Pond. In the eastern edge of a field of a deserted farm topping the first rise west of the pond a bed was found which seemed to answer Emerson's description. The bed, which is some 20 or 30 feet thick, outcrops boldly in the pasture, but nearly all of the loose portions of the rock have been hauled away in clearing the land. At the base of its outcrop this bed is made up of a coarse foliated muscovite rock containing numerous garnets which reach an extreme diameter of 3 or more inches. In color they are reddish black, of a dodecahedral form, with well-developed faces. The granular matrix is readily worked away from the crystals and fine specimens can be developed. Higher in the outcrop the garnet gives out, and the upper part of the bed is made up of a coarse aggregate of a fibrous brown material, in blades which may reach several inches in length, associated with some muscovite and a little quartz and feldspar, together with considerable amounts of a mineral pleochroic in pale

<sup>1</sup> Bull. U. S. Geol. Surv., No. 126, 1895.

brown to almost black, in thin section and apparently tourmaline. This tourmaline is unusual in that it shows in places quite well-defined cleavage parallel to the vertical axis. The rock is somewhat cavernous and rusted as from the oxidation of pyrite. Under the microscope the brown mineral is colorless except where stained by infiltrated limonite. The indices of refraction as determined by immersion are:

$$\alpha=1.644\pm.003.$$

$$\gamma=1.660\pm.003.$$

The elongation is positive, and in all the specimens collected the extinction is exactly parallel and not inclined. The mineral thus appears to unquestionably be anthophyllite rather than cummingtonite. A cleavage fragment was mounted on a one-circle goniometer and the cleavage surfaces were sufficiently bright to give dim, broad reflections of the signal, permitting measurements accurate perhaps to 2 degrees. A prismatic and a (*b*) pinacoidal cleavage were represented and gave the following angles:

	Observed.		Anthophyllite, Dana.	
	o	/	o	/
$m \wedge m' = \dots\dots\dots$	127	19	125	37
$m \wedge m'' = \dots\dots\dots$	53	37	54	23
$m \wedge b = \dots\dots\dots$	64	17	62	49
$m \wedge b = \dots\dots\dots$	63	2	62	49

Crystallographically and optically the numeral thus agrees with anthophyllite, although the mode of occurrence is the same as that of the cummingtonite of the type locality in the adjoining township of Cummington, and the Chesterfield bed seems to represent a continuation of the cummingtonite bed. Just what relationships exist between the orthorhombic and the monoclinic amphiboles in these beds is a subject worthy of some study. It seems not improbable that the monoclinic form is the original less stable mineral and that it is paramorphosed to anthophyllite under the influence of conditions near the surface. Upon analysis the mineral yielded the following results, the ferric oxide being probably extraneous and derived by infiltration from decomposing pyrite. The mineral is referable to the gedrite variety of anthophyllite.

*Analysis of gedrite from Chesterfield, Massachusetts.*

SiO <sub>2</sub> .....	49.66
Al <sub>2</sub> O <sub>3</sub> .....	6.74
Fe <sub>2</sub> O <sub>3</sub> .....	1.23
FeO.....	18.09
CaO.....	3.38
MgO.....	18.62
MnO.....	.05
H <sub>2</sub> O.....	1.56
	99.33

The catalogue number of this material in the Museum collections is 93699.

AN OCCURRENCE OF THE BUCHOLZITE VARIETY OF SILLIMANITE  
IN PEGMATITE.

The specimens upon which the following brief descriptions are based (Cat. 93704, U.S.N.M.) were collected by the writer in the town of Russell, Massachusetts. The locality is on the Woronoco-Blandford road, about 1 mile west of the village of Woronoco, at lower Salmon Falls. The area here is occupied by a silvery mica schist known as the Goshen Schist,<sup>1</sup> much intruded by long, narrow dikes of a medium-grained granite pegmatite of ordinary composition devoid of conspicuous accessory minerals. At the particular point where the sillimanite occurs there are several dikes 8 inches to a foot in width, composed solely of quartz and muscovite. The sillimanite forms a sinuous sheet occupying a central suture in these dikes and varying from 1 millimeter to 2 centimeters in thickness. In other wider dikes the middle is occupied by feldspar in which the sillimanite occurs in small nodules. In still other cases a sheet of sillimanite occupies either side of a narrow dike of the quartz-muscovite rock, in contact with the inclosing schists. The sillimanite has a very finely fibrous felted structure, and is white to pale greenish in color with a silky luster. One of the most marked properties of the mineral is its extreme tenacity. Where sheets of the sillimanite occur in contact with the schists in the bed of the stream the remainder of the dike has been completely eroded away leaving a sheet of the sillimanite exposed. This sillimanite is almost entirely fresh, unaltered and unstained, and scarce abraded at all, although in a position to receive all the wear from stones carried by the torrential brook which is here a succession of waterfalls. The hardness of the sillimanite is 5; specific gravity, 3.172-3.180. Under the microscope the mineral is seen to be composed of curved and divergent aggregates of minute fibers, individually colorless but in mass yielding a brown color by dispersion probably from submicro-

<sup>1</sup> Emerson, B. K., Geol. of Mass. and Rhode Island, Bull., U. S. Geol. Surv. No. 597.

scopic inclusions. The extinction is parallel and elongation positive. Indices of refraction, roughly maximum, 1.635; minimum, 1.629. An analysis yielded:

*Analysis of bucholzite from Blandford, Massachusetts.*

SiO <sub>2</sub> .....	38.10
Al <sub>2</sub> O <sub>3</sub> .....	59.48
Fe <sub>2</sub> O <sub>3</sub> .....	1.05
Ignition .....	1.32
<hr/>	
Total.....	99.95

It seems unquestionable that the sillimanite is derived from portions of the highly aluminous schist absorbed by the pegmatite materials in their upward progress. A noteworthy fact is that in this general vicinity the schist contains veins of coarse granular quartz with small amounts of muscovite and black tourmaline and abundant cyanite. These veins may well represent a phase of the pegmatite intrusion, the compound Al<sub>2</sub>SiO<sub>5</sub> taking the orthorhombic form of sillimanite at a higher temperature, and assuming the triclinic form of cyanite where the temperature was below the inversion point.

STILPNOMELANE FROM NEW JERSEY.

In 1899 F. W. Clarke<sup>1</sup> described, as a new hydromica, a mineral collected by N. H. Darton in a trap quarry at Rocky Hill, N. J. The material is described as in minute flakes thinly matted together; color, a golden bronze with some portions slightly greenish; soft and thinly foliated; under the microscope exhibits no definite crystal form, and its optical properties, while not distinctive, suggest biotite. It is apparently biaxial, with a very small axial angle, and is pleochroic. Heated it does not exfoliate, but fuses to a dark-colored bead. Decomposed readily by hydrochloric acid.

Specimens preserved in the described material of the United States National Museum (Cat. 84735-84736), as the type of this mineral are not the original material, but were received from Washington A. Roebling, of Trenton, New Jersey. The specimens bear the original label in Roebling's handwriting, with the following inscription:

Clarke's new hydromica; see page 71 Dana's App., under vermiculite. The result of the alteration of diabase (precisely how is this accomplished?) from Barber Ireland's Trap Quarry, Lambertville, N. J.

The specimens attracted the attention of the present writer by reason of their remarkable resemblance to the stilpnomelane and chalcodite recently described from Westfield, Massachusetts;<sup>2</sup> and

<sup>1</sup> Clarke, F. W., and Darton, N. H. On a hydromica from New Jersey, *Amer. Journ. Sci.*, vol. 7, p. 365, 1899.

<sup>2</sup> Shannon, E. V. Diabantite, Stilpnomelane, and Chalcodite of Westfield, Massachusetts, *Proc. U. S. Nat. Mus.*, vol. 57, p. 397.

in order to learn if the two occurrences were the same the New Jersey material was examined in some detail. The specimens consist of flat slabs of altered coarse-grained diabase, coated with a layer of soft, finely micaceous material of a golden brown color and sub-metallic luster. Other specimens are veins up to 2 cm. wide, bounded by slickensided surfaces and filled with a very light porous aggregate of minute scales of a dirty greenish brown color. Some specimens are so light as to float upon water. The mineral is soft, barely hard enough to scratch gypsum. Owing to its extremely porous nature the specific gravity could not be determined. Before the blowpipe it fuses with difficulty to a black magnetic slag without exfoliation. It is readily soluble in hydrochloric and sulphuric acids. Boiled in concentrated nitric acid it does not dissolve, but becomes rust brown in color. Under the microscope the material is for the most part in shreds and irregular flakes of minute size with only rarely a suggestion of hexagonal outline. Basal plates are sensibly isotropic. Sections perpendicular to the basal cleavage show birefringence colors reaching first order yellow. The mineral exhibits marked pleochroism in tones of light and dark brownish green. The mean index of refraction is about 1.63. The larger flakes are almost opaque, a condition due to a dark pigment, probably limonite. The material analyzed was from one of the greenish brown veins. While it was essentially pure, there were left behind, when the mineral was dissolved in acid, a few grains of a greenish insoluble mineral probably augite. The results of the analysis are given below together with Steiger's analysis and the mean of two analyses of stilpnomelane from Westfield. Comparison of the analysis of this mineral with that from Westfield will show that the two are identical, except that the New Jersey specimen has suffered more oxidation than that from Massachusetts. Extreme susceptibility to oxidizing influences is one of the most marked characteristics of stilpnomelane, the mineral readily passing over into an indefinite, wholly ferric pseudomorph, known as chalcodite, which is of uncertain composition, a part at least of the iron being present as limonite. The change is accompanied by a considerable increase in the index of refraction, and also by a decrease in the percentage of constitutional water with a greater increase in hygroscopic water. The low water content of the present material may be due to loss of hygroscopic water during the years it has been preserved in a drawer in the collections.



*Analyses of stilpnomelane from New Jersey and Massachusetts.*

	I.	II.	III.
SiO <sub>2</sub> .....	45. 12	44. 08	40. 24
Al <sub>2</sub> O <sub>3</sub> .....	6. 29	4. 74	10. 34
Fe <sub>2</sub> O <sub>3</sub> .....	23. 67	5. 27	24. 57
FeO.....	5. 93	23. 31	5. 21
MgO.....	9. 36	8. 36	6. 78
MnO.....	Trace.	. 87	.....
CaO.....	Trace.	Trace.	.....
K <sub>2</sub> ONa <sub>2</sub> O.....	Trace.	Trace.	2. 20
H <sub>2</sub> O-110.....	} 9. 12	{ 2. 21	3. 03
H <sub>2</sub> O+110.....		{ 10. 28	7. 63
Total.....	99. 49	99. 82	100. 00

I. Stilpnomelane (var. chalcodite) Lambertville, N. J., analyzed by Shannon.

II. Stilpnomelane, Westfield, Mass., average of two analyses by Shannon.

III. Hydromica, Rocky Hill, N. J. Clarke. Analyzed by Steiger; impurities deducted.

The differences between the two analyses of the New Jersey mineral are not great enough to cause surprise when the nature of the material is considered. It seems possible from the description that the specimen described by Clarke may have contained impurities other than the 18.51 per cent calcite and 0.24 per cent titanium dioxide thrown out before recalculation. The alkalis may represent a small amount of feldspar or of a zeolite present as impurity, and a small admixture of diabantite would be impossible of detection by other means than measurements of refractive index. There thus appears no valid reason for regarding the mineral as other than a partly peroxidized stilpnomelane.

Persons familiar with this mineral, and especially New Jersey collectors, have been accustomed to refer to it by a specific name after its discoverer. So far as the writer has been able to learn the substance is not referred to by this name in the literature and printing it has been scrupulously avoided in order to keep it free, as it ethically now is, to be applied at some future time to a worthier species.